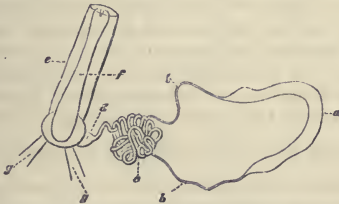


XVIII.—On the Male Generative Organs of *Phalangium*.
By Dr. A. KROHN*.

FROM dissections which I have very recently made, it appears that the notions of Treviranus and Tulk as to the male sexual apparatus of *Phalangium* still generally adopted require to be essentially modified. The principal question here is as to the still unexplained signification of a gland-like organ furnished with two efferent ducts, which is situated in the abdomen upon the lower wall of the alimentary tube, occurs only in the male, and appears, as Treviranus asserts, to have some connexion with the other parts of generation.

My investigations have proved that the above-mentioned organ is the testis; so that the pair of glands consisting of ramified lobes or cæca situated in the anterior part of the abdomen, to which Treviranus and Tulk ascribe the function of preparing the seminal fluid, have quite a different destination.

When the abdomen is opened from the ventral surface, the testis falls out, and appears, after the removal of the adherent fatty body, as a sausage-shaped greatly curved organ† of a dull white colour, bridged over by the two retractor muscles of the penis (fig., *a*). From the extremity of each of its horns (which



The male generative apparatus of the second species of *Phalangium* mentioned in the text, without the accessory glands. Its component parts are removed from their natural position in order to show their connexion.

- a*. The Testis. *b b*. *Vasa efferentia*. *c*. Coil of the *vas deferens*.
d. Dilated portion of the *vas deferens*. *e*. Sheath of the penis, with the penis (*f*) within it. *g g*. Retractors of the penis.

are directed forwards, and do not reach to the part where the two breathing-orifices or stigmata occur on the outer surface

* Translated by W. S. Dallas, F.L.S., &c., from Wiegmann's Archiv, 1865, pp. 41-48.

† The sigmoid or zigzag form ascribed to this organ by Treviranus and Tulk is probably only a consequence of injury or displacement during dissection.

of the body) there issues one of the above-mentioned narrow canals, which may with perfect justice be characterized as *vasa efferentia* (*b b*). In its forward course each of these canals strikes first of all upon the origin of the tracheal stem of its side, then bends inwards, and runs to the median line of the abdomen, where it meets with the canal of the opposite side, and both pass into the origin of the *vas deferens*. Of the nature of this long duct, which gradually increases in diameter, and is chiefly rolled together into a close coil (*c*), Tulk has already given a satisfactory account. I can completely confirm the statement of this naturalist that the *vas deferens*, after passing through the penis, opens at the extremity of the so-called *glans**, which is armed with a curved spine or hook at its apex, and is moveably articulated upon the shaft of the penis. I may, however, remark that the *vas deferens*, after having become suddenly and greatly dilated (*d*) just before its entrance into the penis, appears so exceedingly narrow during its passage through the latter, that the transverse section of its lumen bounded by a chitinous coat only seems very slightly to exceed the diameter of a single seminal corpuscle†.

The testis possesses a bounding membrane which passes into the outer envelope of the efferent ducts; it is, however, not hollow, but its mass consists throughout of round cells, furnished with a distinct wall, and closely pressed together, which contain a great number of small transparent vesicles. As a nucleus, often surrounded by dark granules or molecules, makes its appearance in these vesicles on the addition of acidulated water, I regard them as the formative cells of the semen, whilst the cells enclosing them seem to represent their mother cells.

* This so-called *glans* no doubt functions as an excitant organ during copulation.

† The above-mentioned dilated portion of the *vas deferens* is distinguished from the preceding portions of this canal by a very thick chitinized lining membrane and by a very strong muscular coat. From the great narrowness of the duct in its passage through the penis, it might be supposed that the dilated portion may act as an organ of propulsion in the ejaculation of the semen. According to Tulk, the excitant organ (the so-called *glans*), which, during repose, is always bent back over the end of the shaft of the penis, can be elevated or extended (that is, brought into the same line with the shaft of the penis) by means of two muscles. I must deny the existence of these muscles; but, on the other hand, it is not difficult to detect the presence of a single powerful muscle which is evidently destined to this purpose. This muscle, which has hitherto been overlooked, occupies half the length of the interior of the penis from the base, and is connected with a strong sinew running straight to the excitant organ, to the base of which it is attached. The mode of action of this muscle may be easily ascertained by a simple experiment, namely, by laying bare the sinew, inserting a fine needle into it, and pulling in the direction of the traction of the muscle.

In support of this view I may refer to the data already extant as to the development of the semen in some Arachnida (see Von Siebold, *Vergl. Anatomie*, p. 544, note 6; and Leydig, "Ueber den feineren Bau der Arthropoden," in Müller's *Archiv*, 1855, p. 470).

Mature semen is usually found in greater or less abundance in the entire portion of the *vas deferens* before the dilatation. The seminal corpuscles are rounded structures, furnished, I believe, with a disciform nucleus. The oscillating movement which is observed in them when they are not too closely pressed together appears to be referable to the phenomenon of the so-called molecular movement*.

The two accessory glands situated in the anterior portion of the abdomen immediately above the sheath of the penis are connected by connective tissue and tracheal ramifications with the coil of the *vas deferens*, which is placed between them. Their intimate structure is founded on the same plan that has been made known to us in the glands of many insects by the admirable works of H. Meckel, and especially of Leydig. Thus we may distinguish in them a homogeneous external envelope (*tunica propria*), a subjacent, proportionally thick layer of secreting cells, and within this a lining membrane (*intima*). The lumen of the lobules or cæca appears to be a comparatively narrow canal, from the circumference of which, throughout the whole length of the canal, numerous fine tubules pass deeply into the cellular layer. In the male of *P. opilio* (*P. cornutum*) single tubules are seen at intervals, which are distinguished from the rest both by their greater size and by their branching within the cellular layer. The canals of all the sacs, after uniting to form larger branches, finally combine into a main duct extending forward through the midst of the gland, and opening upon the upper wall of the sheath of the penis not far from the sexual aperture. This duct, however, is never free, as the layer of secretion-cells is continued upon it and envelopes it as far as its outlet. The orifices of the two main ducts at the point just mentioned lie close together on each side of the median line. On the lining membrane of the main ducts and their first branches a so-called spiral filament, similar to that of the tracheæ, may be detected. In the male of *P. opilio* it may be pretty clearly distinguished even on the above-mentioned fine tubules which penetrate the cellular layer.

* I have not been able to give a satisfactory description of the appearance of the seminal corpuscles under a high magnifying power. According to Leydig's investigations, they are round, flat structures, with a central band-like elevation. Leydig regards their oscillating movement as quite spontaneous, and therefore assumes that they probably possess a fine capillary appendage (*l. c.* p. 469, pl. 17. fig. 41 d).

These two glands also occur in the females; but even when their pregnancy is very far advanced, the size of these glands is less than in the males. In their structure they differ from those of the males only in the circumstance that the spiral filament appears to be entirely wanting in the ramifications, although present in the main ducts. The spot at which the two main ducts discharge themselves corresponds exactly with that of the male. Their orifices are also in the vicinity of the sexual orifice, upon the upper wall of the sheath embracing the laying-tube*.

As to the use of the secretion of these glands nothing can at present be stated with certainty. In the male, the secretion is a clear, tenacious, thickly fluid substance, apparently very similar to the spinning-material of the *Araneida*.

In conclusion, I must refer to an exceedingly remarkable phenomenon which I have observed in the examination of nearly all males of *P. opilio*†. This is nothing less than a production of eggs from the testis, at the same time that the development of the semen is by no means diminished. The number of ova produced by the testis may sometimes be so great that, as in the ovary, they occupy the entire surface; or it may be very small, and in this case the ova occur only on particular spots of the testis. In the former case the ova, as on the ovary, present the most various states of development, from the smallest, with the vitellus still clear, to those in which the vitellus appears more or less turbid. These ova, however, appear never to attain the full size of those produced on the ovary. I have only observed one case in which, among a number of ova, two or three were remarkable for their preponderant size. These ova agreed perfectly with the nearly mature ovarian ova, not only in their size, but also in the nature of the vitellus, which appeared of a chalky whiteness. In a second species (which, from the form of the penis, appears to be the one investigated by Treviranus and Tulk), the males of which I was able to procure much more frequently, I have rarely detected ova upon the testis, and when present they were always but little developed.

To remove the suspicion that I may perhaps have erred in

* I may remark here, in passing, that the two supposed cæcal tubes extending to the laying-tube, which Tulk has regarded as cement-glands, are really nerves, as has already been indicated by Gegenbaur (*Grundzüge der vergl. Anat.* p. 276). I have succeeded in tracing them to their origin in the thoracic ganglion. They also occur, although of less size, in the male, in which they accompany the portion of the *vas deferens* issuing from the coil to its immersion in the penis. In both sexes they supply the retractors of the copulatory organs, and also penetrate with a portion of their branches into the interior of the latter, and then become further divided.

† The males of this species are exceedingly rare in comparison to the females.

the interpretation of what I have seen, I may refer to the testimony of a celebrated witness, who detected the same phenomenon long before me. This is Treviranus, who makes the following statement :—" In one of the *Phalangia* that I examined I found an ovary filled with eggs, but, instead of the laying-tube, a male genital organ. Hermaphroditism, which has often been observed in the Lepidoptera, appears, therefore, not unfrequently in the *Phalangia*" (*l. c.* p. 38).

This case, in my opinion, agrees exactly with those observed by me, if we only admit that the organ described as an ovary can have been nothing but the testis. And this will be the less doubtful when we consider that, as already stated, Treviranus certainly saw the testis, but was not in a position to recognize it as such.

As regards the ultimate fate of these eggs, there seems to be no doubt that, after persisting for a longer or shorter time, they disappear. In favour of this we may quote as an analogous example the case of some of our indigneous toads (*Bufo variabilis*, *B. calamita*, and especially *B. cinereus*), the males of which, according to the thorough investigations of Wittich, possess, besides a testis, a more or less rudimentary ovary*. From these investigations it appears clearly that the ova produced by this ovary, after attaining a certain degree of maturity, finally become aborted and disappear †.

XIX.—Descriptions of new Species of Crioceridæ.

By J. S. BALY.

Crioceris scabrosa, Baly.

C. elongata, subcylindrica, plumbea, subnitida, pube aureo-sericea brevi vestita; capite rugoso; antennis dimidio corporis longioribus, obscure rufo-piceis, basi et apice nigris; thorace sat profunde transversim strigoso, fere glabro, lateribus vix constrictis; elytris crebre rugoso-punctatis, elevato-reticulatis, reticulis fere lævibus, glabris, disco anteriore dilatatis, et ibi superficiem totam fere amplectentibus; tarsis obscure cyaneis; tibiis intermediis ad apicem incrassatis, intus curvatis.

Long. 4 lin.

Hab. Mexico.

Elongate, subcylindrical. Head not constricted behind the eyes; face subelongate, finely rugose, sparingly clothed on the

* "Beiträge zur morphol. und histol. Entwicklung der Harn- und Geschlechtswerkzeuge der nackten Amphibien," Siebold and Kölliker's Zeitschrift, Bd. iv. p. 159.

† Morphologically it is an interesting fact that the ovary in the above-mentioned toads occurs as a perfectly independent organ having no further connexion with the testis, whilst the seminal gland of *Phalangium* (especially in *P. opilio*) has completely the character of an hermaphrodite gland.